transplantation and primary angioplasty. The present study confirms recent observations in two small animal models of remote postconditioning, an adenosine-mediated model described by Vinten-Johansen's group in rats exposed to a single 5-minute episode of renal ischaemia initiated before reperfusion,13 and a lapine model of postconditioning subject to limb ischaemia.14 This study highlights the capacity of early remote postconditioning to be of benefit to humans and mandates replication, mechanistic and clinical studies to be performed in order to usher in the decade old paradigm of mechanical conditioning to the bedside.

Authors' affiliations

Gyorgy Andreka, Marton Vertesaljai, Gergely Szantho, Gusztav Font, Zsolt Piroth, Geza Fontos, Laszlo Szekely, Zsolt Szelid, Peter Andreka*, Gottsegen Hungarian Institute of Cardiology, Budapest, Hungary Eszter D Juhasz, 2nd Department of Medicine, Semmelweis University, Budapest, Hungary

Mark S Turner, Bristol Royal Infirmary, Bristol, UK

Houman Ashrafian, Department of Cardiovascular Medicine, University of Oxford, Oxford, UK

Michael P Frenneaux*, Department of Cardiovascular Medicine, The University of Birmingham, Birmingham, UK

*MPF and PA have contributed equally as the principal investigators of this study and are joint senior authors.

Funding: This work was supported by grants from the OTKA (Grant F43380 to P A), the ETT (Grant 302/2003 to P A), the Gottsegen Hungarian Institute of Cardiology (to PA) and the Semmelweis University (to PA). PA is the recipient of the Hungarian Academy of Sciences Bolyai Postdoctoral Fellowship. G Sz is the recipient of the Research Fellowship of the European Society of Cardiology.

Competing interests: None.

REFERENCES

- Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet 2003;361:13-20.
- 2 Halkin A, Stone G, Dixon S, et al. Impact and determinants of left ventricular function in patients undergoing primary percutaneous coronary intervention in acute myocardial infarction. Am J Cardiol 2005;96:325-31.

- 3 Ito H, Maruyama A, Iwakura K, et al. Clinical implications of the 'no reflow' phenomenon. A predictor of complications and left ventricular remodeling in reperfused anterior wall myocardial infarction. Circulation 1996;93:223-8.
- 4 Cannon RO III. Mechanisms, management and future directions for reperfusion injury after acute myocardial infarction. Nat Clin Pract Cardiovasc Med
- 5 Yellon DM, Downey JM. Preconditioning the myocardium: from cellular physiology to clinical cardiology. Physiol Rev 2003;83:1113-51
- Kloner RA, Rezkalla SH. Preconditioning, postconditioning and their application to clinical cardiology. *Cardiovasc Res* 2006;70:297–307.
 Zhao ZQ, Vinten-Johansen J. Postconditioning: Reduction of reperfusion-induced
- injury. Cardiovasc Res 006, **70**:200–11.
- 8 **Staat P**, Rioufol G, Christophe P, et al. Postconditioning the human heart. Circulation 2005; 112:2143-8.
- 9 Laskey WK, Staat P, Rioufol G, et al. Letter regarding article by Staat et al, postconditioning the human heart. Circulation 2006;113:e665
- 10 Sutton MS, Pfeffer AM, Moye L, et al. Cardiovascular death and left ventricular remodeling two years after myocardial infarction: baseline predictors and impact of long-term use of captopril: information from the Survival and Ventricular Enlargement (SAVE) Trial. *Circulation* 1997;**96**:3294–9.
- 11 Yellon DM, Hausenloy DJ. Realizing the clinical potential of ischemic preconditioning and postconditioning. Nat Clin Pract Cardiovasc Med 2005;2:568–75.
- 12 Okamoto F, Allen BS, Buckberg GD, et al. Reperfusion conditions: importance of ensuring gentle versus sudden reperfusion during relief of coronary occlusion. Cardiovasc Surg 1986;**92**:613–20.
- 13 Kerendi F, Kin H, Halkos ME, et al. Remote postconditioning. Brief renal ischemia and reperfusion applied before coronary artery reperfusion reduces myocardial infarct size via endogenous activation of adenosine receptors. Basic Res Cardiol 2005;100:404-12.
- 14 Li CM, Zhang XH, Ma XJ, et al. Limb ischemic postconditioning protects myocardium from ischemia-reperfusion injury. Scand Cardiovasc J 2006:40:312-17
- 15 Schmidt MR, Smerup M, Konstantinov IE, et al. Intermittent peripheral tissue ischemia during coronary ischemia reduces myocardial infarction: first demonstration of remote ischemic perconditioning. Am J Physiol Heart Circ Physiol. Published Online First 15 Dec 2006. doi: 10, 1152/ajpheart.00617.,
- 16 Kim RJ, David S, Fieno BS, et al. Relationship of MRI delayed contrast enhancement to irreversible injury, infarct age, and contractile function. Circulation 1999;**100**:1992–2002.
- 17 Crisostomo PR, Aairiuko GM, Wang M, et al. Preconditioning versus postconditioning: mechanisms and therapeutic potentials. J Am Coll Surg 2006;202:797–812.
- 18 Kharbanda RK, Mortensen UM, White PA, et al. Transient limb ischemia induces remote ischemic preconditioning in vivo. Circulation 2002;106:2881-3.
- Gho BCG, Schoemaker RG, van den Doel MA, et al. Myocardial protection by brief ischemia in noncardiac tissue. Circulation 1996;94:2193-2200.
- 20 Iliodromitis EK, Georgiadis M, Cohen MV, et al. Protection from postconditioning depends on the number of short ischemic insults in anesthetized pigs. Basic Res Cardiol 2006;101:502-7
- 21 Schwartz LM, Lagranha CJ. Ischemic postconditioning during reperfusion activates Akt and ERK without protecting against lethal myocardial ischemia-reperfusion injury in pigs. Am J Physiol Heart Circ Physiol 2006;290:H1011-18.
- 22 Heusch G. Postconditioning: old wine in a new bottle? J Am Coll Cardiol 2004;44:1111-12.

Save your favourite articles and useful searches

Use the "My folders" feature to save and organise articles you want to return to quickly—saving space on your hard drive. You can also save searches, which will save you time. You will only need to register once for this service, which can be used for this journal or all BMJ Journals, including the BMJ.